

REMARKS

Applicants respectfully request reconsideration of this application, and reconsideration of the Office Action dated May 30, 2003 (Paper No. 10). Upon entry of this Amendment, claims 1, 2, and 4-12 will remain pending in this application. Previously withdrawn claims 3 and 13-20 are cancelled. Applicants reserve the right to pursue the subject matter of claims 3 and 13-20 in subsequent divisional applications. The amendments to the claims are fully supported by the specification and original claims. No new matter is incorporated by this Amendment.

With respect to the change to claim 1, Applicants submit that claim 1 was amended to correct an antecedent basis problem noticed by Applicants upon review of the claims. Hence, the change to claim 1 is in no way intended to narrow the scope of original claim 1.

Applicants gratefully acknowledge the Examiner's indication that claims 1, 2, 4-6, 8, and 10 are allowed. Applicants also acknowledge the Examiner's indication that claims 7, 9, and 11 contain allowable subject matter. In the Office Action, the Examiner indicated that claims 7, 9, and 11 would be allowed if rewritten to overcome the rejection under 35 U.S.C. § 112, second paragraph. In response, Applicants, as discussed below, have amended claims 7, 9, and 11 in a manner which addresses the 112 rejection. Hence, claims 7, 9, and 11 are believed to be in condition for allowance.

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Claim 12 is objected to because of an informality. Specifically, the Office Action asserts that the terminology "an side" should be "a side." In response, claim 12 has been amended as suggested, thus overcoming the objection. Withdrawal of the objection is requested.

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Claims 7, 9, and 11 are rejected under 35 U.S.C. § 112, second paragraph, as purportedly indefinite. Applicants traverse.

The Office Action points to certain phrases which are said to lack proper antecedent basis and thus lead to confusion. In response, Applicants have amended claims 7, 9, and 11 to address each of the issues pointed out in the Office Action and to ensure each feature has proper antecedent basis. Hence, the rejection is overcome and its withdrawal is respectfully requested.

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Claim 12 is rejected under 35 U.S.C. § 102(b) as purportedly anticipated by Matsuoka (U.S. Pat. No. 5,614,423). The Office Action asserts that Matsuoka discloses each feature of claim 12. Applicants respectfully traverse.

Independent claim 12 recites a method of making a heterojunction bipolar transistor. The method includes forming a mask layer with a pattern on a compound semiconductor film for forming an emitter mesa, and forming said emitter mesa by wet-etching said compound semiconductor film by using said mask layer. The pattern has a first pair of sides extending in a predetermined direction, a second pair of sides extending in a direction intersecting the predetermined direction, and a mask portion extending from one of said first pair of sides to a region opposite to the other side of the first pair of sides. In addition, the mask portion has a side extending in a direction of a line inclining toward said side of said first pair of sides.

To assist in explaining the differences between the present invention and Matsuoka, Applicants submit Figures A and B as attachments along with this Amendment. Fig. A corresponds to Fig. 8A of the present specification. Fig. A shows a

pattern (102) of a photomask, and not a mask layer. Fig. B shows a pattern (10A) of the mask layer as shown in Fig. 4 of the present specification. Since the mask layer is formed by using the photomask in a photolithography method, the pattern (10A) of the mask layer is similar to the pattern (102) of the photomask.

Applicants respectfully submit that Matsuoki fails to teach or fairly describe each and every feature of claim 12. The M.P.E.P. requires that a reference teach each and every feature of the claimed invention in order to anticipate the claimed invention. *See M.P.E.P. § 2131*. Applicants now return to Fig. B. The method of claim 12 includes forming a mask layer with a pattern which has a pair of first sides (U11, U13) and a second pair of sides (U12, U14). The sides in the first pair (U11, U13) extend along lines (B1, B2), respectively. The sides in the second pair (U12, U14) extend along lines (B3 and B4), respectively. The pattern (10A) further has a mask portion (V1) extending from one (S11) of said first pair of sides (U11, U13) toward region (OUTSIDE) opposite to the other side (U13) of the first pair of sides (U11, U13). In other words, the mask portion (V1) extends exteriorly beyond the line (B1) which is co-linear with the side (U11). In contrast, while layer 7 (as shown in Fig. 2) of Matsuoka has a portion defined between the line A and the line B, it does not have a portion extending exteriorly beyond a line which is co-linear with the side. Hence, Matsuoka fails to teach each and every feature of the claimed invention and can not anticipate claim 12.

In view of the above remarks, Applicants respectfully submit that the rejection is overcome. Withdrawal of the rejection is thus respectfully requested.

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Applicants respectfully submit that this Amendment and the above remarks obviate the outstanding objection and rejections in this case, thereby placing the

application in condition for immediate allowance. Allowance of this application is earnestly solicited.

If any fees under 37 CFR §§1.16 or 1.17 are due in connection with this filing, please charge the fees to Deposit Account No. 02-4300; Order No. 033035.084.

If an extension of time under 37 CFR § 1.136 is necessary that is not accounted for in the papers filed herewith, such an extension is requested. The extension fee should be charged to Deposit Account No. 02-4300; Order No. 033035.084.

Respectfully submitted,

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LISTING OF CLAIMS

Claim 1 (currently amended): A method of making a heterojunction bipolar transistor, said method comprising the steps of:

A¹ forming a mask layer on a compound semiconductor film by a photomask for forming an emitter mesa; and

forming ~~an~~ said emitter mesa by wet-etching said compound semiconductor film by said mask layer;

wherein said photomask has a pattern thereon for forming said emitter mesa;

wherein said pattern is defined by a first area portion associated with a shape of said emitter mesa to be formed, and a plurality of second area portions; and

wherein each of said second area portions has first and second sides meeting each other to form an acute angle therebetween, and a third side in contact with said first area portion.

Claim 2 (original): A method of making a heterojunction bipolar transistor according to claim 1, wherein said first area portion is defined by a first pair of sides extending in a first direction, and a second pair of sides extending in a second direction intersecting said first direction; and

wherein each of said second area portions is arranged such that said third side is in contact with one of said first pair of sides of said first area portion.

Claim 3 (cancelled)

Claim 4 (original): A method of making a heterojunction bipolar transistor according to claim 1, wherein each of said second area portions is formed into a triangle defined by said first to third sides; and

wherein said first side of each second area portion is oriented in a direction in which one of said first and second pairs of sides extends.

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Cont.
Claim 5 (original): A method of making a heterojunction bipolar transistor according to claim 1, wherein said emitter mesa has a first pair of sides extending in a predetermined direction, and a second pair of sides extending in a direction intersecting said predetermined direction.

Claim 6 (original): A method of making a heterojunction bipolar transistor according to claim 5, wherein an inverted mesa structure is formed at said first pair of sides in said emitter mesa and a normal mesa structure is formed at said second pair of sides in said emitter mesa in said wet-etching step.

Claim 7 (currently amended): A method of making a heterojunction bipolar transistor according to claim 1, wherein said ~~mask layer has a pattern with~~ first area has a pair of edges extending in crystal axis [011] direction of said compound semiconductor film.

Claim 8 (original): A method of making a heterojunction bipolar transistor according to claim 1, wherein said compound semiconductor film includes an InP semiconductor.

Claim 9 (currently amended): A method of making a heterojunction bipolar transistor according to claim 8, wherein said etching mask layer is made of resist.

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cont
Claim 10 (original): A method of making a heterojunction bipolar transistor according to claim 8, further comprising a step of forming an InGaAs base region essentially constituted by eight sides.

Claim 11 (currently amended): A method of making a heterojunction bipolar transistor according to claim 8, wherein said ~~mask-layer~~ first area has a pair of edges extending in crystal axis [011] direction of said compound semiconductor film; and

said method further comprising the steps of:

forming said ~~III-V~~ compound semiconductor film prior to said step of forming a said mask layer;

forming a an InGaAs base region ~~including an InGaAs semiconductor~~ after said step of forming an emitter mesa; and

forming an emitter electrode and a pair of base electrodes in a self-alignment fashion with respect to said emitter mesa after said step of forming a said base region.

Claim 12 (currently amended): A method of making a heterojunction bipolar transistor, said method comprising the steps of:

forming a mask layer with a pattern on a compound semiconductor film ~~a mask layer~~ for forming an emitter mesa; and

forming ~~an~~ said emitter mesa by wet-etching said compound semiconductor film by using said mask layer;

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~~wherein said mask layer has a pattern for forming said emitter mesa;~~ wherein said pattern has a first pair of sides extending in a predetermined direction, a second pair of sides extending in a direction intersecting said predetermined direction, and a mask portion extending from one side of said first pair of sides to a region opposite to the other side of the first pair of sides; and

wherein said mask portion has ~~an~~ a side extending in a direction of a line inclining toward said side of said first pair of sides.

Claims 13-20 (cancelled)



Fig. A

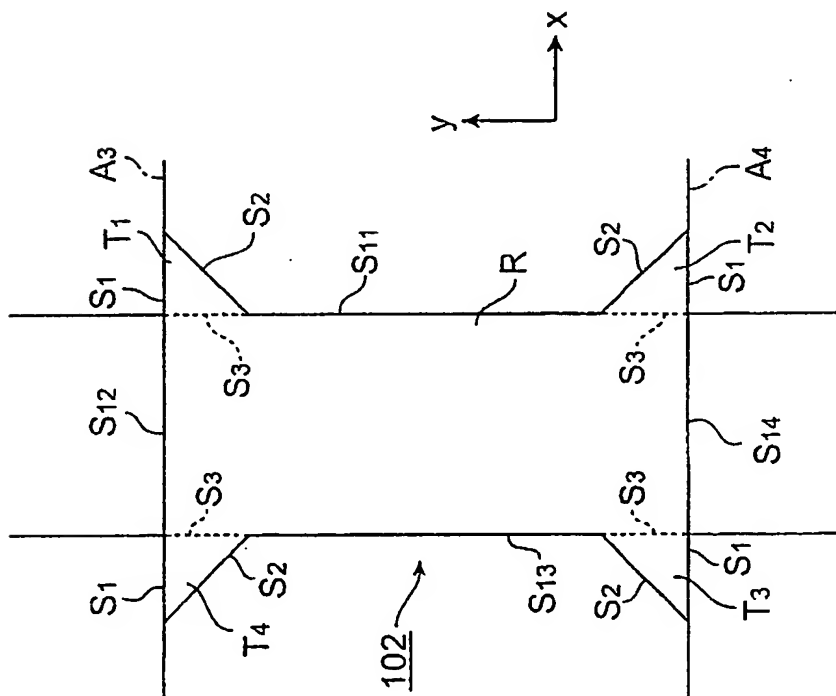


Fig. B

